

Description

FLAT PANEL DISPLAY MOUNTING BRACKET

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of United States Provisional Application No. 60/435,036 filed on December 20, 2002 for FLAT PANEL DISPLAY MOUNTING BRACKET, the entire disclosure of which is fully incorporated by reference.

BACKGROUND OF INVENTION

[0002] The present invention relates to a mounting bracket for mounting a viewing screen, and particularly relates to a mounting bracket that is adapted for use in mounting an LCD flat panel display screen.

[0003] There are many applications in which a flat panel display screen must be mounted onto a surface for display of the flat panel. One such application is the display of information to a vehicle operator, for example the operator of a commercial vehicle. The display may relate to, for exam-

ple, a night vision system, a rear vision system, etc. In this case, the flat panel display screen is preferably mounted within the line of sight of the vehicle operator. For example, the display screen could be mounted on a vehicle dashboard, headliner, or other portion of the vehicle. It is desirable that the position and orientation of the display be adjustable and that the display be able to be moved to a stored position.

SUMMARY OF INVENTION

[0004] The present invention is directed to an apparatus, such as for mounting a flat panel display screen in a vehicle. The apparatus includes a mounting plate for fastening to a flat panel display screen. In one embodiment, at least one friction hinge enables the mounting plate with mounted display screen to be rotated, pivoted, or the like to any one of many configurations having a variety of angular relationships with the dashboard or other supporting surface about a first pivot axis substantially parallel to the supporting surface. Another embodiment of the present invention includes a second hinge, swivel, pivot point, or the like allowing the mounting plate and mounted display screen to be rotated or pivoted about a second pivot axis substantially normal to the first pivot axis. In another em-

bodiment, the base is fixed. The mounting plate has a plurality of fastener openings and is thereby adapted to support a display panel at a plurality of locations.

BRIEF DESCRIPTION OF DRAWINGS

- [0005] The foregoing features of the present invention will become apparent to one skilled in the art to which the present invention relates upon consideration of the following description of the invention with reference to the accompanying drawings, in which:
- [0006] Fig. 1 is a perspective view of a mounting apparatus in accordance with a first embodiment of the invention, shown supporting a flat panel display screen;
- [0007] Fig. 2 is a schematic elevational view of the mounting apparatus and display screen of Fig 1;
- [0008] Fig. 3 is a schematic elevational view of the mounting apparatus of Fig. 1 shown supporting a different display screen;
- [0009] Fig. 4 is a sectional view taken generally along line 4-4 of Fig. 3;
- [0010] Fig. 5 is a perspective view of a mounting plate that forms part of the mounting apparatus of Fig. 1;
- [0011] Fig. 6 is a sectional view of the mounting plate of Fig. 5;

- [0012] Fig. 7 is a perspective view of a fixed base that forms part of the mounting apparatus of Fig. 1;
- [0013] Fig. 8 is a sectional view of the fixed base of Fig. 7;
- [0014] Fig. 9 is a perspective view of the assembled mounting plate and fixed base;
- [0015] Fig. 10 is an elevational view of the assembled mounting plate and fixed base;
- [0016] Fig. 11 is a perspective view of a first part of a two-bracket base assembly that is a mounting apparatus in accordance with a second embodiment of the invention;
- [0017] Fig. 12 is a perspective view of a second part of the two-bracket base assembly of Fig. 11;
- [0018] Fig. 13 is an elevational view of the assembled mounting plate and two-bracket base assembly;
- [0019] Fig. 14 is a bottom plan view of the assembled mounting plate and two-bracket base assembly;
- [0020] Fig. 15 is a perspective view of a pedestal base assembly that is a mounting apparatus in accordance with a third embodiment of the invention;
- [0021] Fig. 16 is a sectional view of the pedestal base assembly of Fig. 15;
- [0022] Fig. 17 is a perspective view of a first part of the pedestal base assembly;

- [0023] Fig. 18 is a plan view of the first part of the pedestal base assembly;
- [0024] Fig. 19 is a perspective view of a second part of the pedestal base assembly;
- [0025] Fig. 20 is a perspective view of an extender plate that is part of a mounting apparatus of the present invention;
- [0026] Fig. 21 is a perspective view showing the extender plate in use with the two-bracket base assembly of Fig. 11;
- [0027] Fig. 22 is an elevational view of the extender plate and two-bracket base assembly; and
- [0028] Fig. 23 is a bottom plan view of the extender plate and two-bracket base assembly.

DETAILED DESCRIPTION

- [0029] The present invention relates to the mounting of a display on a vehicle. In particular, the present invention relates to apparatus for mounting an LCD display screen or display panel on an internal surface of a vehicle. The invention is applicable to mounting apparatus of differing constructions. As representative of the present invention, Fig. 1 illustrates a mounting apparatus 10 that is constructed in accordance with a first embodiment of the invention.
- [0030] The mounting apparatus 10 is shown as mounting an LCD display panel 12 (Figs. 1 and 2) on a support surface, such

as the support surface indicated schematically at 14, which may be part of the dashboard of a vehicle 16. An LCD display panel 12 or other device that is mounted by the mounting apparatus 10 may have differing configurations in different embodiments. The panel 12 that is illustrated in Figs. 1 and 2 has a rectangular, box-like configuration including front and back major side surfaces 18 and 20, top and bottom edge surfaces, and left and right edge surfaces. The front side surface 18 of the panel 12 is the display side.

[0031] The back surface 20 of the panel 12 has provisions for mounting (supporting) the panel. Specifically, the illustrated panel 12 has two columns of fastener openings 24 and 26 spaced apart from each other to form four rows (pairs) of fastener openings. The fastener openings 24 and 26 are adapted to receive fasteners, such as screws 88, for mounting the panel 12.

[0032] Figs. 3 and 4 show an LCD display panel 12a having a different provision for mounting (supporting) the panel. Specifically, the panel 12a shown in Figs. 3 and 4 has a central T-slot 28. The T-slot is adapted to receive one or more T-bolt assemblies 89 that are commonly used for adjustably mounting some types of flat panel displays.

[0033] The mounting apparatus 10 includes one mounting plate 30 that is attached to the display panel 12, and that may be interchangeably connected with any selected one of a plurality of different bases (described below in detail). The different bases are provided to adapt the mounting plate 30 for support on a variety of different support surfaces in a variety of different manners. The mounting apparatus 10 also includes an extender plate (described below). The single mounting plate 30 is adapted to fit with about 99% of automotive LCD displays on the market. Having to use only mounting plate 30 simplifies the purchasing and installation for customers.

[0034] In the illustrated embodiment, the plurality of bases includes a fixed base that is designated 32; a pedestal base assembly that is designated 36; and a two-bracket base assembly that is designated 34. The extender plate is designated 38. The mounting of the display 12 on a support surface 14 is described herein first with reference to the fixed base 32, then with reference to the other bases 34 and 36, followed by a description of the use of the extender plate 38.

[0035] The mounting plate 30 may be formed as one piece, for example by stamping and forming or by casting. The

mounting plate 30, like the other parts of the mounting apparatus, is preferably formed from steel. The mounting plate 30 includes a fastener portion 40. The mounting plate 30 also has first and second base connection portions 42 that extend from the fastener portion.

[0036] The fastener portion 40 of the mounting plate 30 is adapted to engage the back side surface 20 of the panel 12. The fastener portion 40 has a generally rectangular, plate-like configuration including first and second opposite major side surfaces 44 and 46 (Fig. 6). The fastener portion 40 has a U-shaped configuration defining a mounting opening 47 for enabling an electric cable or wire to pass through from an attached LCD panel.

[0037] The fastener portion 40 includes two columns 48 of slots 50. Each column 48 includes four rows (pairs) of slots 50. The slots are arc segments. There are 2 circular patterns of 4 slots each. Four slots mate with four screw holes in the LCD. The slots 50 in one column 48 are opposite the slots in the other column and form associated pairs of slots (fastener openings). The slots 50 are angled at about a forty-five degree angle with respect to vertical. The fastener portion 40 of the mounting plate 30 also has two circular fastener openings 52 that are spaced apart verti-

cally in the center of the fastener portion 40.

[0038] Each horizontally opposed set of slots 50 defines a panel mounting location. Thus, the illustrated mounting plate 30 has 2 sets of slots 50 that define two panel mounting locations. Other mounting plates 30 in accordance with the invention could have more than or fewer than four mounting locations defined by the fastener openings in the mounting plate.

[0039] The base connection portions 42 of the mounting plate 30 extend forward from the bottom end of the first major side surface 44 of the fastener portion 40. The two base connection portions 42 are preferably identical to each other, as in the illustrated embodiment.

[0040] Each one of the base connection portions 42 defines a cylindrical pin channel 58. The two pin channels 58 are co-axial with each other and between them define a first pivot axis 60 of the mounting plate 30 and of the mounting apparatus 10.

[0041] Each base connection portion 42 has a front wall 62 that extends parallel to the plane of the fastener portion 40. The front wall 62 includes two small fastener openings 64 that extend into the pin channel 58. Each base connection portion 42 also has a bottom wall 65 that extends normal

to the plane of the fastener portion 40. The bottom wall 65 includes one blind bore 66 that extends next to the pin channel 58.

[0042] The fixed base 32 is adapted to engage and support the mounting plate 30, thereby to support the panel 12 non-movably on a support surface 14, such as a vehicle dashboard. The fixed base 32 could also be mounted on a different support surface 14, such as an overhead panel of a vehicle interior, for example.

[0043] The fixed base 32 includes a base plate 70 that has a semi-circular or curved-triangular configuration including a straight side 72 and a curved side 74. The base plate 70 may be planar but is preferably bowed slightly upward in the middle. The base plate 70 has opposite upper and lower major side surfaces 76 and 78. (It should be understood that the fixed base 32 may be mounted on an overhead support surface 14 such that the "upper" and "lower" designations are reversed.) The fixed base 32 has three support pads 80 for engagement with the support surface 14. The support pads 80 are generally circular portions of the fixed base 32 that project downward from the base plate 70. Two of the support pads 80 are located at the intersections of the curved side 74 and the straight side

72 of the base plate 70. The third support pad 80 is located at the center of the curved side 74 of the base plate 70. Each support pad 80 has a fastener opening 81 for receiving a fastener to fasten the fixed base 32 to a support surface 14.

[0044] The support pads 80 when in engagement with a support surface 14 form a tripod configuration that holds the base plate 70 spaced apart from the support surface. In this position, the center of the base plate 70 is bowed upward from the edges of the base plate and thus is farther from the support surface 14.

[0045] The fixed base 32 includes first and second plate connection portions 82. The plate connection portions 82 are identical to each other. Each one of the plate connection portions 82 is configured as a tab that projects upward from the base plate 70. Each tab 82 has a circular fastener opening 84. The two fastener openings 84 are co-axial along a line that extends parallel to the straight side 72 of the base plate 70. The tabs 82 are spaced apart from each other by a distance appropriate for mating with the overall width of the two base connection portions 42 of the mounting plate 30.

[0046] The first and second plate connection portions 82 of the

fixed base 32 are engageable with the first and second base connection portions 42 of the mounting plate 30, to connect the mounting plate with the fixed base. Specifically, the base connection portions 42 of the mounting plate 30 are placed between the tabs 82 of the fixed base 32. The pin channels 58 in the mounting plate 30 are aligned with the fastener openings 84 in the tabs 82 of the fixed base 32. Two fasteners 86, which as illustrated are self-tapping or machine screws, are used to fasten the mounting plate 30 to the fixed base 32. Each fastener 86 extends axially through a fastener opening 84 in a tab 82 of the fixed base 32 and into a pin channel 58 of the mounting plate 30.

[0047] The engagement of the fasteners 86 in the mounting plate 30 secures the mounting plate to the fixed base 32. The mounting plate 30 as thus secured is not rotatable or pivotable relative to the fixed base 32. If the fasteners 86 are loosened or removed, the mounting plate 30 can be pivoted about the first pivot axis 60, relative to the fixed base 32, then retightened to place the parts in a different relative position. This adjustability accommodates support surfaces 14 of differing angles and orientations relative to the desired angle of display of the panel 12 when the

mounting apparatus 10 is installed.

[0048] The display panel 12 is engageable with the fastener portion 40 of the mounting plate 30 to connect the display panel with the mounting plate. To this end, the fastener portion 40 of the mounting plate 30 is placed in a position adjacent to and overlying the back side surface 20 of the panel. If the slot mounting is to be used, a selected set of slots 50 in the mounting plate 30 is aligned with a selected set of fastener openings 24 and 26 in the back side surface 20 of the display panel 12. Any one of the pairs of slots 50, and any one of the rows of fastener openings 24 and 26, can be used, depending on where it is desired to locate the panel 12 vertically relative to the mounting plate 30.

[0049] A set of fasteners 88 such as screws are extended through the fastener openings 50 in the mounting plate 30 and screwed into the fastener openings 24 and 26 in the display panel 12. The engagement of the screws 88 in the display panel 12 secures the display panel on the mounting plate 30. The panel 12 is positioned vertically on the mounting plate 30 at the desired location along the columns of slots 50 and the columns of fastener openings 24 and 26. The arcuate configuration of the slots 50 al-

lows for tilting the panel 12 slightly relative to the mounting plate 30, to adjust for a tilted support surface 14, for example.

[0050] If the T-slot mounting is to be used, as shown in Figs. 3 and 4, a T-bolt assembly shown at 89 is inserted through one of the two fastener openings 52 in the center of the fastener portion 40 of the mounting plate 30. Either one of the two openings 52 can be used, depending on where it is desired to locate the panel 12 vertically relative to the mounting plate 30. The T-bolt assembly 89 engages in the T-slot 28 in the center of the back side surface of the display panel 12a. The mounting plate 30 is positioned vertically on the panel 12a at the desired location along the length of the T-slot 28. The T-bolt assembly 89 is tightened to secure the panel 12 in position relative to the mounting plate 30.

[0051] The fixed base 32 is fastened to the support surface 14 to maintain the panel 12 in the desired position on the support surface. Three fasteners, such as screws (not shown), are placed through the fastener openings 81 in the support pads 80 of the fixed base 32 and screwed into the support surface 14. The fixed base 32 is thereby supported on the support surface 14. The fixed base 32 sup-

ports the mounting plate 30, which supports the display panel 12. The display panel 12 is thereby supported on the support surface 14. The curved or bowed configuration of the base plate 70 can accommodate an instrument panel 14 that is not flat in the area where it is desired to locate the display panel 12--if the support surface is bowed upward, for example.

[0052] The initial position of the display panel 12 relative to the support surface 14 can be changed or adjusted in the manners noted above--by selecting a particular pair of slots 50 in the fastener portion 40 of the mounting plate 30, or by selecting a particular pair of fastener openings 24 and 26 in the display panel, or a particular vertical location along the T-slot 28 in the display panel.

[0053] The angular orientation of the display panel 12 relative to the support surface 14 can be changed or adjusted in the manners noted above--with the slots 50, and with the screws 86 that connect the mounting plate 30 to the fixed base 32. The display panel 12 can not be tipped either forward or backward about the first pivot axis 60, to lie flat over the support surface 14, once it is set in position, because of the fixed engagement of the mounting plate 30 with the fixed base 32.

[0054] The two-bracket base assembly 34 (Figs. 11–14) is designed to support the mounting plate 30 at a location relatively close to the support surface 14, like the fixed base 32. In addition, the two-bracket base assembly 34 provides the capability of tipping or pivoting the mounting plate 30 (and the display) about a generally horizontal axis such as the axis 60, to provide for varying the angle of viewing and for laying the panel 12 or 12a flat on the support surface.

[0055] The two-bracket base assembly 34 includes two brackets 90. Each one of the two brackets 90 of the base assembly 34 includes a hinge support base 92, a hinge support barrel 94, and a friction hinge 96. The hinge support base 92 has a generally flat first portion 98 that is adapted to overlie the support surface 14. The first portion 98 has a fastener opening 100 for receiving a fastener, such as a screw 102, to secure the hinge support base 92 to the support surface 14.

[0056] The hinge support base 92 also includes two upstanding ears 104 that are spaced apart from each other and that have aligned pin openings 106 in them. The pin openings 106 in the ears define a pivot axis 108 that extends generally parallel to the flat first portion 98 of the hinge sup-

port base 92.

[0057] The hinge support barrel 94 is cylindrical and has an interior configured to receive and support, in a non-rotatable manner, the friction hinge 96. On the exterior of the barrel 94 there is formed a mounting tab 110 with a pin opening 112.

[0058] The mounting tab 110 of the hinge support barrel 94 is received between the ears 104 of the hinge support base 92. A suitable connector 114, which may be a pivot pin, extends through the pin openings 106 in the ears 104 of the hinge support base 92 and through the pin opening 112 in the mounting tab 110 of the hinge support barrel 94. The pivot pin 114 supports the hinge support barrel 94 on the hinge support base 92 for pivotal movement relative to the hinge support base about the pivot axis 108.

[0059] The friction hinge 96 is received in the hinge support barrel 94. The friction hinge 96 is a known type of friction connection that includes a friction pin 120 frictionally rotatable in a sleeve 121. The friction hinge may be, for example, a Hexatorq brand hinge from Kato corporation. The friction hinge constitutes a resistive pivot or friction connection that is usable to set and maintain the relative

position of its two interconnected parts without the need for locking knobs (by "locking knobs" is meant structure such as knobs or such as other manually engageable members that are tightened to hold the plate in position once set). The friction hinge of the present invention is superior to a ball joint, for example, because there is no clamping and unclamping of parts needed, and because the materials of the friction hinge provide for tens of thousands or more repetitions without losing resistivity.

[0060] The sleeve 121 is fixed in the barrel 94. The friction pin 120 projects from the barrel 94 for engagement by the mounting plate 30 and has two through holes. The friction pin 120 thus constitutes a plate connection portion of the bracket 90. As the two-bracket base assembly 34 includes two of the brackets 90, the assembly 34 thus has two plate connection portions 120.

[0061] The first and second plate connection portions 120 of the two-bracket base assembly 34 are engageable with the first and second base connection portions 42, respectively, of the mounting plate 30, to connect the mounting plate with the two-bracket base assembly. Specifically, the friction pins 120 of the two-bracket base assembly 34 are inserted into the pin channels 58 in the base connection

portions 42 of the mounting plate 30. Two fasteners 122, which as illustrated are self-tapping screws or machine screws, are used to fasten the mounting plate 30 to each one of the two brackets 90. Each screw 122 extends through one of the fastener openings 64 (Fig. 5) in the front wall 62 of the base connection portion 42 of the mounting plate 30 and through the through holes in the pins 120 and are threaded into the wall 42 of the mounting plate. The screws 122 fix the mounting plate 30 for movement with the friction pins.

[0062] The engagement of the fasteners 122 in the mounting plate 30 secures the mounting plate to the two-bracket base assembly 34. The mounting plate 30 as thus secured is rotatable, or pivotable, relative to the two-bracket base assembly 34, about the first pivot axis 60 which extends through the friction hinges 96 and specifically through the friction pins 120. The friction hinges 96 support the mounting plate 30 on the two-bracket base assembly 34 for pivotal movement relative to the base assembly about the first axis 60. Any selected position of the mounting plate 30 is maintained by friction inherent in the friction hinges 96.

[0063] The base assembly 34 is fastened to the support surface

14 to locate the panel 12 in the desired position on the support surface 14. Two fasteners 102, such as screws, are placed through the fastener openings 100 in the first portions 98 of the hinge support bases 92 and are screwed into the support surface 14. The two brackets 90 are thereby secured to the support surface 14. The brackets 90 support the mounting plate 30 and the display panel 12 on the support surface 14.

[0064] In addition, the two pieces of each bracket 90, the barrel 94 and the barrel support 92, are pivotal relative to each other about the pivot pin 114. This adjustability accommodates support surfaces 14 of differing angles and orientations relative to the desired angle of display of the panel 12. The two brackets 90 can thus be mounted at different orientations, or on a sloping or otherwise uneven surface, while still maintaining the mounting plate upright. Thus, second and third pivot axes are provided by the brackets 90 that are different from the axis of the two friction hinges.

[0065] The display 12 can be tipped backward about the first pivot axis 60, to lie flat over the support surface 14. Thus, a flat screen display, such as a LCD flat screen display 12, may be secured to the mounting plate 30 and be movable

between a plurality of positions relative to the support surface 14 on which the base assembly 34 is placed. The positions include a first position at which the screen 12 is upright and visible to a user, and a second position in which the screen is laid flat substantially parallel to the supporting surface 14. The friction hinges 96 hold the screen 12 in the selected position.

[0066] The pedestal base assembly 36 (Figs. 15–19) is designed to support the mounting plate 30 at a location spaced apart from the support surface 14 by a distance greater than is provided by the fixed base 32 or the two-bracket base assembly 34. In addition, the pedestal base assembly 36 provides the capability of swiveling the mounting plate 30 (and the display 12) about a vertical axis as well as a horizontal axis, to provide for greater adjustability of viewing of the display. The mounting plate 30 can be tipped back parallel to the surface 14, or forward parallel to the surface 14 if the LCD display panel is mounted high enough on the mounting plate.

[0067] The pedestal base assembly 36 includes a base 130 for fixation to the support surface 14 and a yoke 132 that is supported on the base for pivotal movement relative to the base. The base 130 includes a base plate 134. The

base plate 134 is a triangular plate that has an upwardly bowed configuration and includes three support pads 136 at its three corners.

[0068] The base 130 also includes a pedestal 138 that extends upward from the center of the base plate 134. The pedestal 138 has a hollow cylindrical configuration and includes an internal friction hinge 140. The friction hinge 140 may be of a known construction similar or identical to that of the friction hinges 96 (Figs. 11–14). A screw 142 and slip washer 143 fix a first portion 144 of the friction hinge 140 to the pedestal 138. The head of the screw 142 projects radially.

[0069] The yoke 132 has a sleeve portion 146 that fits over the pedestal 138 and fixedly engages a second portion 148 of the friction hinge 140. The yoke 132 is rotatable with the second portion 148 of the friction hinge 140, on the pedestal 138, about a second pivot axis 150 relative to the first portion 144 of the friction hinge. Such rotation between the first and second portions 144 and 148 of the friction hinge 140 is resisted by the internal friction of the friction hinge.

[0070] A screw slot 152 in the sleeve portion 146 of the yoke 132 receives the head of the screw 142. The circumferential

length of the slot 152 sets the extent of rotation of the yoke 132 on the pedestal 138. Engagement of the screw 142 with the ends of the slot 152 limits the rotation of the yoke 132 relative to the pedestal 138. A second screw opening is provided for the screw 142, 180 degrees opposite, if it is desired to set up the yoke to face the opposite direction. The screw 142 holds the first portion 144 of the friction hinge 140 on the base 130, and, because it is received in the slot 152, keeps the yoke 132 from coming off the base. This can be important because the friction hinge itself may not perform that function, and can be especially important if the base assembly is mounted upside down, for example, on the interior roof panel of a vehicle. The screw 142 also acts as a rotational stop for the yoke on the base.

[0071] The yoke 132 includes an arm assembly 160 that is supported on the sleeve portion 146 of the yoke. The arm assembly 160 includes first and second arms 162 that project outwardly in a direction away from the second pivot axis 150. Each one of the arms 162 supports a friction hinge 164. The friction hinges 164 are preferably similar in construction to the friction hinges 96 of the two-part base assembly 34.

[0072] The friction hinges 164 of the pedestal base assembly 36 are engageable with the mounting plate 30, in the same manner as described above with reference to the second embodiment, to support the mounting plate on the pedestal 138 for pivotal movement relative to the pedestal about the first pivot axis 60. In addition, the mounting plate 30, when thus supported, is pivotable relative to the support surface 14 about the second pivot axis 150. In many mounting applications, the first pivot axis 60 is generally horizontal and the second pivot axis 150 is generally vertical.

[0073] The display 12 as thus supported on the mounting plate 30 can be tipped forward about the first pivot axis 60, to lie flat over the support surface 14, because the first pivot axis is spaced apart from the support surface by a distance that is greater than the front-to-back thickness of the display. This can help to protect the face of the display 12, as well as to minimize any obstruction of the vehicle operator's forward field of view. The display 12 can also be tipped backward about the first pivot axis 60, to lie flat over the support surface 14, because the display is above the mounting plate fastener portion 40 when this is done.

[0074] Figs. 20–23 illustrate the extender plate 38. The extender plate 38 is preferably made from the same material as the fixed base 32. The extender plate 38 is illustrated in Figs. 21–23 as being used with the two–bracket base assembly 34. The extender plate 38 is connectable between the mounting plate 30 and the plate connection portions of each one of the fixed base 32 and the pedestal base and the two–bracket base assembly 34. The extender plate 38 enables alternative positioning and orientation of the display screen 12 relative to the support surface 14.

[0075] The extender plate 38 has a planar central portion 170 and two end portions 172 and 174. The first end portion 172 of the extender plate 38 has first and second base connection portions 176 that are similar or identical in configuration to the first and second base connection portions of the mounting plate 30. The first and second base connection portions 176 of the extender plate 38 have coaxial pin channels 178 that define a pivot axis 179. The first and second base connection portions 176 serve the same function as, and can take the place of, the first and second base connection portions 42 of the mounting plate.

[0076] The second end portion 174 of the extender plate 38 has

first and second plate connection portions 180. The first and second plate connection portions 180 are upstanding tabs that are disposed on a common axis 182. The tabs 180 of the extender plate 38 serve the same function as, and can take the place of, the first and second plate connection portions (i.e. friction pins) 120 of the two-bracket base assembly 34; or the fasteners 86 used with the fixed base 32; or the friction hinges 164 of the pedestal base 36.

[0077] As shown in Figs. 21–23, the extender plate 38 is connected between the mounting plate 30 and the plate connection portions 120 of the brackets 90 of the two-bracket base assembly 36. The base connection portions 176 of the extender plate 38 receive the friction pins of the brackets 90. As a result, the extender plate 38 is connected with the base assembly 36 for pivotal movement relative to the base assembly 36 about the first pivot axis 60.

[0078] The base connection portions 142 of the mounting plate 30 receive the plate connection portions (tabs) 180 of the extender plate 38. Screws 175 extend through openings in the extender plate and are screwed into tapped holes in the base bracket. As a result, the mounting plate 30 is

connected with the extender plate 38 for pivotal movement relative to the base assembly 36 about the first pivot axis 60. The extender plate 38 in this manner enables alternative positioning and orientation of the display screen 12 relative to the support surface.

[0079] With the extender plate 38 thus in position between the mounting plate 30 and the base assembly 36, the first pivot axis 60 is spaced apart from the mounting plate 30. As a result, the mounting plate 30 (and an attached display screen 12) can be tipped forward to lay the display surface flat or nearly flat on the support surface 14. This is not possible without the extender plate 38. When the extender plate 38 is used with the pedestal base 36, the mounting plate 30 (and an attached display screen 12) can be tipped forward to lay the display screen flat or nearly flat on the support surface 14.

[0080] From the above description of the invention, those skilled in the art will perceive improvements, changes, and modifications in the invention. Such improvements, changes, and modifications within the skill of the art are intended to be included within the scope of the appended claims.